

READERS--

Letters are now beginning to come in on a fairly regular basis, and we will be publishing some of them so that you can compare thoughts. We have had requests for various pieces of information, and though we may not be able to cover every question asked, we will try to answer those most frequently mentioned. November's issue was unpardonably late, but contained some useful information. Because of limited space, it is not possible for us to cover every aspect of each subject in ColorCue. Readers may still have some questions about subjects in some of the articles we have published. Address specific questions to us, and perhaps in another issue we will cover other aspects of these features.

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On the Sof-Disk front -- We have three new Albums ready for shipment. These are BONDS, EQUITY, and INCOME TAX '78. The BONDS Album will be of use to those of you who want to make more informed investment decisions. You can determine yeild and maturity accurately and quickly. The EQUITY Sof-Disk can figure total long-range costs to aid in purchasing and depreciation decisions. The BONDS and EQUITY Sof-Disk Albums sell for \$19.95 each, and the TAX '78 Album is \$29.95. All three include printed instructions to make program use easier. All of these progams require 16K of memory. We are pleased to announce that our INCOME TAX'78 program is ready just in time to caluculate your 1978 return. It is very easy to use, and it calculates the form 1040 and Schedule A. The program is set up so that all of the entry lines are numbered the same as these forms. The lines are color-coded so that you know exactly where to enter a number or when to wait for a calculation. When all your entries are finished, you will have a fast, flawless, return. We can't promise that doing your taxes will be fun, but the TAX '78 program will make it less of a strain. Order from your dealer, or use the enclosed form.

Those of you who have not yet purchased your Programming and Reference Manual may want to do so soon. Many dealers have them in stock. It explains the special features of BASIC on the COMPUCOLOR II and is indispensable for using color and Graphics.

ADVANCED APPLICATION

Input Flag Values and The INPUT Table

On the COMPUCOLOR II, INPUT flags make the world go round. Any time a character is passed from one device to a program, or from a program to a device, or from a program to another program, an input flag is associated with it and the value of this flag determines the character's destination and usage. Characters from the keyboard come in on KEYFL (33247), Output from BASIC goes out on BASFL (33265), and output from FCS on LOFL (33273). (Input to FCS is echoed on another flag, FCSFL (33249), so that output from commands entered at the keyboard may be sent to the serial port. See Escape G.)

When a character is generated from some source in the COMPUCOLOR II, the value of the flag associated with it is used as an index into the INPUT table. As each entry is an address of a routine which will be called with the character and the address of the flag as parameters. The routine can then modify the flag value, setting a new destination for the next character, store or display the character, or both store that character and modify the flag.

As a common example let us examine the CRT mode. When the keyboard (or BASIC or FCS) is in CRT mode, the flag associated with it contains the value 0. The entry of the INPUT table corresponding to zero is the video display routine. When the display routine receives a character it either stores the character in the display buffer if the character is printable, or it interprets it as a control character if it is not. Control characters are used to erase the screen or a portion thereof and otherwise manipulate the display. When, for example, control-C (value 3) is sent to the CRT, the display routine alters the value of the current flag from 0 to 3 and returns. This means that the next character to come in on that flag will not go to the display routine and will instead be received by the routine corresponding to the value three in the INPUT table. Therefore the next character will not be displayed even if it is printable. When a character is received by the routine at entry 3, the character is stored as the new cursor X value and the flag is changed from value 3 to 5. The routine then returns to the caller. When a character is received by the routine at entry 5, the character is stored as the new cursor Y value and the cursor is moved to its new location. The flag is then changed from value 5 to 0 and the next character will be interpreted by the display routine. Thus we can see why control characters do not affect the display when used as data for a previously initiated sequence.

All multi-byte control sequences are implemented in this way. Graphics mode is a special case where the flag of the generating device or program is set to 2 and the usage of the character is determined by the system graphics mode.

When BASIC is entered from the CRT mode the BASIC interpreter sets the flag value to 23, which entry in the INPUT table is the address of BASIC's input control routine. Thereafter all data entered goes directly to BASIC without being displayed. BASIC then may display or interpret the data as it chooses. In this manner BASIC echoes the keyword 'SAVE' whenever control-shift S is entered. BASIC's output flag, BASFL, may be controlled from the program by using PLOT statements, but it should be emphasized that the Keyboard flag, KEYFL, will remain set to 23 for as long as BASIC requires input. (When BASIC does not require input, the flag is set to 0, which causes data to be displayed.) A similar mechanism controls input to FCS.

More information concerning the use of INPUT flags will be forthcoming future issues of ColorCue.

ENTRIES OF THE INPUT TABLE

00	System Display Routine
01	Blind Cursor Mode Display Routine
02	Graphics Mode
03	Expecting Cursor X Address (changes flag to 5)
04	Color Pad Plot Mode (non-color control characters go to Display)
05	Expecting Cursor Y Address (changes flag to 0)
06	Expecting New CCI Code (changes flag to 0)
07	Expecting Blind Cursor X Address (changes flag to 8)
08	Expecting Blind Cursor Y Address (changes flag to 9)
09	Expecting Blind CCI Code (changes flag to 1)
10	Unused
11	Unused
12	Garbage Dump (all characters ignored; flag not chaged)
13	FCS Input Routine
14	Serial Port Output
15	Unused
16	Unused
17	Unused
18	Expecting Baud Rate 0 - 7 (changes flag to 0)
19	Unused
20	Unused
21	Unused
22	Unused
23	BASIC Input Routine
24	Unused
25	Expecting Fill Screen Character (changes flag to 0)
26	Unused
27	Expecting Escape Sequence (changes flag to 0,4,13,18,23,25)
28	Unused
29	Unused
30	Unused
31	Unused

Unused INPUT table entries all jump to location 81C5 hex (33221 DEC) and may be used by the programmer if an appropriate jump is poked into that location.

KEEPING IT SIMPLE

Character String Manipulations

The COMPUCOLOR II Extended Disk BASIC has three functions which are used to manipulate character strings. They are:

```
LEFT$(X$,I)
RIGHT$(X$,I)
MID$(X$,J,I)
```

In each case, X\$ represents the string being operated on, and 'I' represents the number of characters to be returned. The only difference between the functions is the location in the string where the 'I' characters will come from. With LEFT\$, it will be the first 'I' characters, and with RIGHT\$, the last 'I' characters. MID\$ contains an additional variable 'J' which indicates the starting position within X\$.

MID\$ is the most flexible of these three functions and can in fact be used in place of the other two functions. For example, MID\$(X\$,1,I) is exactly equivalent to LEFT\$(X\$,I). To use MID\$ in place of RIGHT\$, however, we must know the length of X\$. The equivalency would therefore be MID\$(X\$,LEN(X\$)-I+1,I). Obviously, the RIGHT\$ function would be easier to use.

```
100 X$="ABCDEFGHIJKL"
110 PRINT LEFT$(X$,4)
120 PRINT MID$(X$,1,4)
130 PRINT RIGHT$(X$,4)
140 PRINT MID$(X$LEN(X$)-4+1,4)
150 PRINT MID$(X$,5,4)
```

Lines 110 and 120 will both print out the first four characters of X\$ or 'ABCD'. Lines 130 and 140 will both print out the last four characters of X\$ or 'IJKL'. Line 150 will print out the 4 characters starting with the 5th character or 'EFGH'.

If the number of characters (I) is greater than the number of characters available, the function will return what is available and will not generate an error. This frees the user from having to check the length of a string prior to using a function. A CF error (Call Function) will be generated, however, if 'I' or 'J' is less than one (1). In the above examples we change line 100 to X\$="" (a null string) a CF error will occur in line 140. This is because the value for J is evaluated as -3, an illegal value.

A problem frequently encountered is the need to right justify columns of numbers. The following routine will easily accomplish this where X is an integer number.

```
100 INPUT "X = ";X
110 X$ = "          " + STR$(X)
120 PRINT RIGHT$(X$,8)
```

This program converts X to a character string and adds it to a string of blanks. By printing out the right portion of this string, all values will be right justified. A similar routine could be written which would also handle decimal numbers.

SOFTWARE EXPLAINED

The Deluxe Keyboard

This may well come more under the heading of 'Hardware Explained', but since the special function keys aid in the creation of displays, we will leave it in this category.

We have had a number of questions concerning the use of the special function keys, both from people making buying decisions and from people who already own the deluxe keyboard. The special function keys do not expand the capabilities of the machine, but like the numeric and color pads, they enable the user to accomplish a task with fewer keystrokes.

The special function keys are used in the CRT mode to create displays. These displays can be saved by entering the following BASIC program before the display is created:

```
0 PLOT 27,4:PRINT "SAVE SCREEN.DSP 7000 1000":END
```

You then hit CPU reset to return to the CRT mode, where the display can be entered. When the display is complete, hit ESC E to reset BASIC and RUN the previously entered one-line program. The ESC E sequence will produce the message 'READY', which will be saved along with the display. You may want to set the foreground and background colors to the same color as your display background so that this message will be invisible when saved.

Essentially, the special function keys send an ASCII character to the screen. The key at the far left labelled 'F0 VECT INC' sends ASCII 240, and the keys to the right each send a code one larger than the one to their left. The keys are labelled according to the vector graphics as listed in Chapter 9 of the Programming and Reference Manual. Therefore, these keys can be used to create any graphic display that is possible on the COMPUCOLOR II. To give values for the various plot modes, the computer reads the ASCII values of the keys. (You will find these values in the back of the Programming and Reference Manual.) Try the following example:

```
CTRL B
CTRL @
CTRL @
F2
CTRL @
DEL
DEL
DEL
CTRL @
CTRL @
CTRL @
F15
```

It will draw a rectangle around the screen.

Corrections and Comments

November ColorCue contained a few unfortunate errors. They were small, but those of you who are experimenting with some programming know that even small errors can ruin the whole program. On page 2, line 140 should read `IF I$="N" THEN 210`. There was no line 220 in the program to which it could transfer. Probably most of you were able to notice this by yourselves. On page 3, lines 20 and 30 are almost the same. Line 20 should read `RD=3.14159265/180` and line 30 should read `P2=3.14159265*2`.

A reader from New York who is working on teaching himself BASIC says that he saves short example programs of various routines and functions, and then refers to them when writing programs. Some of you might find this clever idea quite useful.

Another reader has written in to ask if there is any way to make the screen scroll down instead of up. Sorry, but this is a complicated task. It involves changing the machine software. However, you may change the pertinent statements in the SCROLL program to make certain sections of your screen scroll down instead of up.

With this issue, you should all have received three issues of ColorCue -- October, November and December. If you are missing one or more of these issues, please let us know so that we can have it sent to you.

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